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Applying Human Interaction Management Concepts to E-Mailing: A Visualized Conceptual Model

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ABSTRACT

Electronic mail (e-mail) is one of the dominant IT applications used by knowledge workers and managers. Its key functionality remains the same despite being used for much more than simple messaging: document sharing and archiving for example. At the same time, e-mail is one of the main sources of information overload, which threatens the efficiency, effectiveness and health of knowledge workers. In this paper we address this problem by taking a human-driven and collaborative perspective going beyond traditional Business Process Management: we apply Human Interaction Management (HIM) concepts in constructing a conceptual model for the processing of e-mails. We subsequently use the model to build an exploratory prototype of an add-in for a popular e-mail client hence making the model more tangible and understandable. The prototype shows the implementability of the model and can serve to gain more feedback on its validity, and inspire new ideas about its other uses, such as linking e-mail to collaborative workspaces.

INTRODUCTION

Over the past years electronic mail has become one of the dominant forms of communication in the workplace, and replaced to a great extent other forms of written communication such as paper correspondence and fax. E-mail was designed as a simple messaging platform and is widely used as such, but has in addition become the number one collaborative application for knowledge workers, and used as a platform for other areas of work such as personal archiving and task management (Whittaker & Sidner, 1996). In many places of work, users have to manage large amounts of e-mail, and there are indications that experienced users receive between 100

and 200 e-mail messages a day (Schuff, Turetken, & D'Arcy, 2006). It is thus evident that many users face a problem of information overload in an environment designed to facilitate communication. E-mail overload is particularly a problem for high-level employees, for knowledge workers and in enterprises where large amounts of important information are exchanged.

Human Interaction Management (HIM) is a relatively new concept emphasizing human interactions such as communication, teamwork, planning and knowledge sharing. According to one of its proponents, Harrison-Broninski (2008), traditional Business Process Management fails to support dynamic human-driven processes based on humans collaborating and inventing, and explicitly mentions high-level work, knowledge work and sectors where human activity is critical. He proposes a practical framework and notation where processes are arranged by their users as work goes on, and past knowledge and experience is actively used to improve these dynamic processes. HIM can be applied using Human Interaction Management Systems (HIMSs). Although HumanEdj, a well-known HIMS, has a built-in e-mail client to support interaction management features it only addresses e-mail overload in a limited way.

From the above there is a motivation to try to combine already existing scientific research on e-mail overload with the HIM principles that apply to it, to discover new means of addressing the problem of e-mail overload. Consequently, our research question is:

- How can HIM principles contribute to dealing with e-mail overload?

To address this question, a conceptual model will be constructed based on strategies from existing literature on e-mail overload combined with HIM principles. The model can be seen as a contribution both to knowledge about HIM and the research field of information overload. To validate the model, its key elements will be implemented as features in a plug-in for Microsoft Outlook, a widely used e-mail client. The model can also be seen as a vision for one of the possible directions of the future development of e-mail clients.

The rest of the paper first outlines the literature on which we base our problem statement and proposed model. The construction of the model is then explained in detail. The features of the above mentioned plug-in are explained and rationalized with regard to the model, and screenshots from a non-working prototype are shown. Finally, suggestions for further development of the application are made, its deployment to support empirical research on the model is discussed, and other suggestions on how to validate the model are laid down.

E-MAIL OVERLOAD

Information overload is not new. Bawden, Holtham, and Courtney (1999) summarize that information overload “occurs when information received becomes a hindrance rather than help when the information is potentially useful.” (p 249) The causes of this can largely be attributed to the increasing amounts of available information, effect of new technologies, more emphasis on collaborative work and the fact that end-users increasingly search for information themselves instead of using an intermediary.

One of these technologies, electronic mail, was introduced to some offices in the 1980s to facilitate internal communication about business matters. Its early success can be attributed to the fact that it allows for convenient, asynchronous communication. The evolution of e-mail applications and mainstream adoption of Internet connectivity among businesses led to an explosion in the use of e-mail, and by the mid-nineties, e-mail use was widespread in places of work (Baron, 2000).

Duchenaute and Belotti (2001) concluded from an extensive study that e-mail has become the major means of non-face-to-face communication and a place where users spend much if not most of their workdays. Not only do e-mail users receive large amounts of e-mail every day, but e-mail is used as much more than just a messaging platform. It is the main means of document exchange and many users use their inbox as a to-do list. Among the authors' conclusions is the notion that e-mail is overloaded, it is more of a habitat than an application, and that its embeddedness has led to the fact that it is used to manage a variety of task that e-mail was not designed to support.

In a frequently cited article, Whittaker and Sidner (1996) came up with the term "e-mail overload" to describe the effects of this use of e-mail for tasks it was not designed for. They describe "cluttered inboxes containing hundreds of messages, including outstanding tasks, partially read documents and conversational threads." They observed the largely unsuccessful attempts of users to file and archive the large amounts of messages in their inbox and categorized users using different filing strategies into three main groups: frequent filers, spring cleaners and no-filers. The average size of the inbox of study participants (2482 items) was found to be around three times the average number of filed items (858 items). The average number of messages per day was about 50.

Another perspective on e-mail overload is provided by Cavanagh (2003). She defines e-mail overload as "[the] daily struggle to find and manage the relevant within a seemingly endless supply of incoming messages". Her research shows a similar average of 48 messages per day, and in addition, that 64 percent of e-mail messages require a response. The remaining 36 percent are not relevant or for informational purposes only. Simple calculations done by the author based on these numbers indicate that an average user needs four hours a day to manage his or her incoming messages.

E-mail overload can increase stress levels at work. Pratt (2006) quotes a study indicating that 69 percent of senior managers find the daily task of responding to e-mail either mildly or moderately stressful. Cavanagh (2003) also notes that the number one dislike about e-mail is the "mental fatigue of overload and wrestling with messages." Camargo (2008) attributes this to the incessant nature of e-mail, and the possibility that employees become constantly worried about missing important messages. Another survey by Reuters focusing on information overload revealed that a large number of managers believed information overload had caused loss of job satisfaction, damaged their personal relationships and health, and that important decisions were delayed and adversely affected (Bawden et al., 1999).

The other major adverse effect of e-mail overload mentioned by researchers is waste and loss of profits due to unnecessary time spent on e-mail management. The American Management

Association found in a 2004 study that 60% of participants spend more than 90 minutes a day on e-mail, and that 30% of participants spend more than three hours on it (Pratt, 2006). Cavanagh (2003) concludes from her research that the average loss in annual revenue due to e-mail overload is 12 percent.

EXISTING APPROACHES TO E-MAIL MANAGEMENT

In order to organize the large amount of e-mails received many different techniques have been developed. Following is a brief survey of these techniques.

Filing or archiving: By filing (or archiving) the user archives e-mail messages in folders, so that the task of retrieving them becomes easier. One of the advantages of this technique is that it provides a structured handling of received e-mail messages instead of piling them all up in one inbox. However, creating folders and maintaining them in an organized structure requires a considerable amount of effort on behalf of the user. Even if users dedicate some time to archiving their messages there is no guarantee that their method of archiving will be efficient when retrieving them, and that the time spent on archiving a message is not necessarily offset by the time saved on finding it. In addition, not all users prefer to archive their e-mail on a regular basis. Some prefer not to archive at all, in case they should not be able to recall into which folder they have moved their messages (Whittaker & Sidner, 1996).

Filtering: With filters, users can filter messages which they believe are not important, thus reducing the amount of messages received. There are many types of filters available, from filters designed to block incoming unsolicited (spam) e-mail to automatic filing filters which automatically organize e-mail into folders depending on the sender, the subject or other relevant information. According to one study done on the usage of e-mail filters, 60 percent of users state that they don't use their own filters for e-mail management most because they haven't understood the function of them and how they are applied (Ducheneaut & Belloti, 2000). In addition most of the users believe that up to two thirds of their incoming e-mail would not be possible to filter. One of the biggest problems of this technique is that if perceived unwanted e-mail is omitted, important messages may be lost. In addition, filtering incoming messages into different folders does not necessarily reduce the mental workload of going through them.

Threading: By threading, the e-mail client presents a series of e-mails on the same subject (or what can be perceived as a conversation) as one line in the inbox, similar to an online message board. When the user selects the message he or she wants to read, the original message is presented as well as all the replies on that topic by different users ordered by the time in which they were sent. This feature makes it easier to keep track of conversations while reducing the amount of lines in the inbox. Threading algorithms can differ between clients and vary from simply sorting messages by subject (e.g. Microsoft Outlook, Mozilla Thunderbird) to more sophisticated algorithms (e.g. Google Mail). A summary of e-mail threading algorithms is provided in Palme (1998).

Full text search: Each message is thoroughly indexed word for word, and the user can then enter a number of keywords such as sender, e-mail subject or even fragments from the message body and the search engine returns the e-mails that are relevant to the search. This is a straightforward way to retrieve messages, and spares the user the effort of sorting or indexing.

Other, more novel approaches have been put forth by practitioners and academics. Schuff et al. (2006) suggest automatically clustering e-mail messages instead of displaying them in an ordered list, and found that this method improves users' ability to locate them. A tool made by researchers, Bifrost Inbox Organizer, categorizes the inbox itself using a predefined rule set. Its authors state that its trial users found it an excellent tool for prioritizing e-mail reading (Bälter & Sidner, 2002). Another tool, the Taskmaster system made by four PARC researchers (Bellotti, Duchenaut, Howard, & Smith, 2003), recasts e-mail as a task management system by embedding task management directly in the inbox.

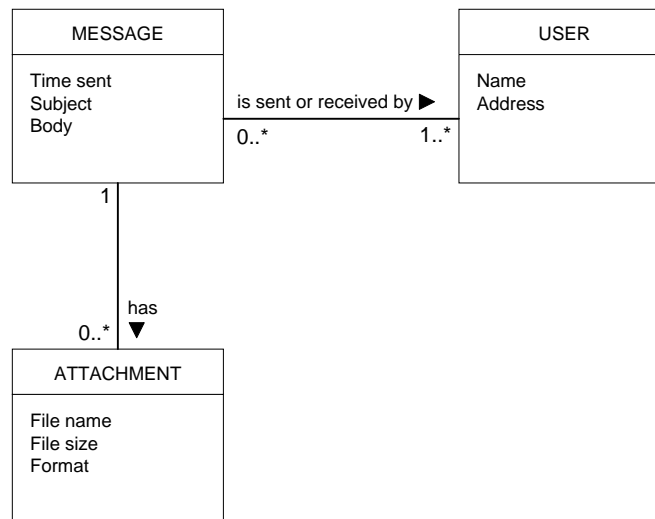
We conclude that there are already techniques for coping with e-mail overload, yet addressing e-mail processing from a collaborative and complex human-driven process and task perspective is still limited.

MODEL CONSTRUCTION

Typical e-mail users affected by e-mail and information overload are users who perform knowledge- and interaction-intensive work. HIM accommodates for such work with concepts that go beyond traditional Business Process Management (BPM) and recognizes that collaborative work cannot be boiled down to defined, mechanical processes, but needs to be adaptive (Harrison-Broninski, 2008, 2009). It terms the type of work mentioned above as "human-driven" as opposed to "mechanistic" and proposes new ways to model it. Both Finger (2007) and Harrison-Broninski (2009) name examples of processes that are human driven and information based: product development, research, complex sales, mergers, acquisitions and marketing campaigns, among other types of work.

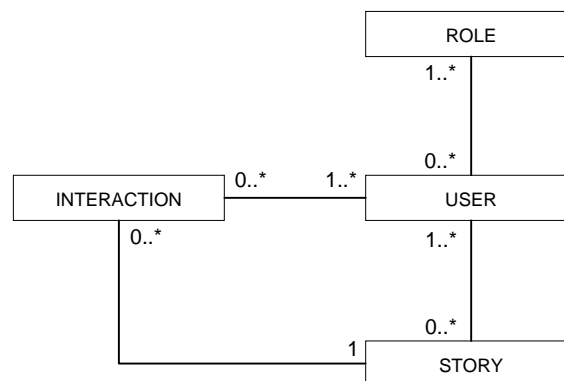
One of the key concepts of HIM is the *story*, which is a collaborative work process that the participants evolve on the fly as part of the work itself (Harrison-Broninski, 2008). Stories involve roles (representing goals and responsibilities), users (the participants) and interactions (meaningful communications). A story can thus be any routine or ad-hoc collaborative activity which needs adaptive process control. These are typical examples of work where ideas, views and work-in-progress are thrown back and forth among participants in e-mail messages and attachments.

Our model is constructed by combining overlapping concepts from the domain of e-mail and the HIM principles, and adding corresponding concepts where we identify them lacking. We use basic notation based on Unified Modeling Language (UML, see for instance Booch, Rumbaugh, & Jacobson, 2005) for presenting the original conceptual models. A representation of the e-mail domain is shown in Figure 1.

Figure 1: Representation of the e-mail domain.

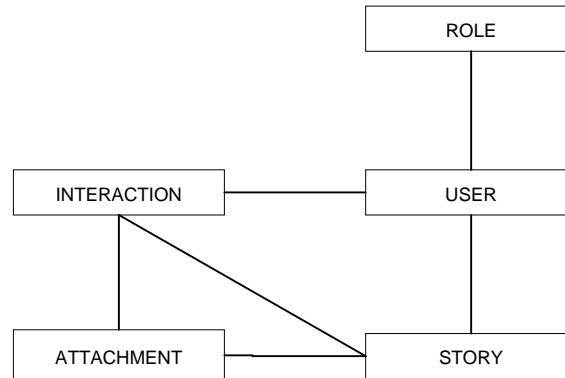
The concept of sender or recipient is boiled down to the concept “user“ in order to simplify the model.

As mentioned before, the concept of story is one of the main concepts in Human Interaction Management. It represents a collaborative work process involving human interactions (Harrison-Broninski, 2008). The direct interrelations of a story to other concepts are shown in Figure 2.

Figure-2: The Story-concept in relation to other HIM concepts.

A user is an actual person, or employee. This user can have multiple roles, and participate in any number of stories at a time. The interaction concept is linked to user rather than role, because a story is an instance of a human-driven process rather than the process itself.

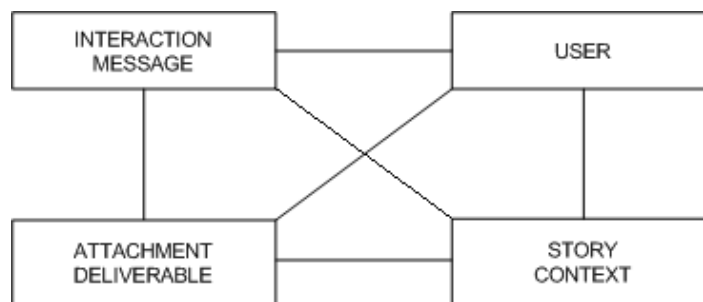
By comparing the two conceptual models, it is clear that an e-mail message represents a (meaningful) interaction between two users, and the e-mail user and user in HIM are virtually identical concepts. Thus, we can merge the two models as shown in Figure 3. To simplify presentation, no attributes or multiplicities are depicted.

Figure 3: E-mail and HIM converged.

Currently, we have three concepts from one domain lacking corresponding concepts in the other:

- The **STORY** represents the purpose or context of an interaction between users. In addition, many scholars and practitioners have come up with means of organizing e-mail messages automatically or interactively, thereby providing context to the messages. Therefore, we can say that the corresponding concept for its relation with **MESSAGES** and **ATTACHMENTS** is **CONTEXT**.
- The **ATTACHMENT** represents a work products or deliverable shared among users in HIM. We will thus use the term **DELIVERABLE** as a corresponding concept, and link them to **USERS** (who collaborate in creating them) and **STORIES** (the joint purpose of creating them).
- The **ROLE** has no obvious corresponding concept within e-mail, except for mailing groups. Mailing groups are, however, often created in a broader context, such as large intra-company lists for departments or business units.

By adding the two new corresponding concepts to the above model, adding the new links or associations and removing **ROLE**, we have our final conceptual model, which we choose to call the E-mail collaboration context model, shown in Figure 4.

Figure-4: E-mail collaboration context model.

This model complements a part of HIM. Almost all human-driven processes have some kind of deliverable, and a very common way of delivering it is by e-mail. Moreover, this perspective highlights the shortcomings of the common practice of using e-mail for collaborative work on deliverables and suggests a more sophisticated way, such as using collaborative workspaces.

The model also suggests that common e-mail messages, which are indeed asynchronous conversations and interactions, lack the context parameter. The typical way of giving context to e-mail by archiving it into a project/assignment/sender folder has many shortcomings as has been explained before. The Story concept from HIM, which is the work context from a broad perspective, offers a solution to this problem by adding a useful attribute or relation to a message without changing its location.

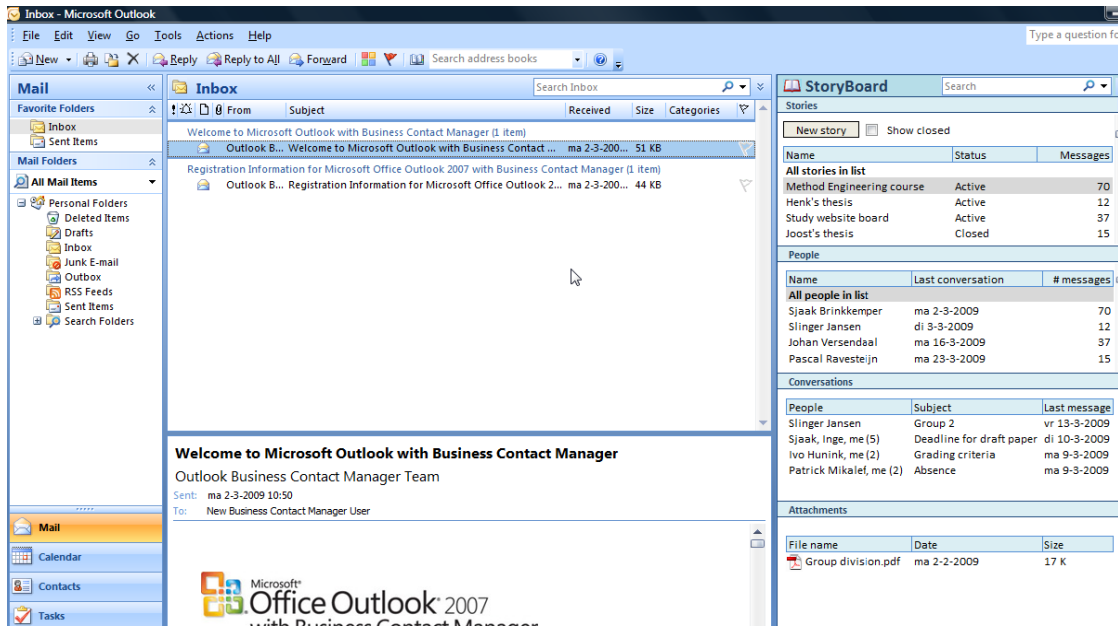
Attempts at this have already been made by providing categories (or colors) for e-mails and by means of centralized case management. In the following chapter, we will propose a new way, based on the broad story-concept of HIM, to grant context to e-mail messages in a structured, yet flexible manner.

STORYBOARD – A PLUG-IN FOR AN E-MAIL CLIENT

We have put the model to practical use by means of explorative prototyping (Floyd, 1987). StoryBoard is our mock-up of a to develop Microsoft Outlook plug-in. By implementing the model as a plug-in, users can use their current e-mail client and e-mail server but still use new functionality. The plug-in recognizes the fact that e-mail is the number one collaborative tool of knowledge workers rather than denying it, and is designed to ease both overview and retrieval of contextually related e-mail and attachments. Since full-text search and sophisticated threading algorithms are already popular retrieval methods, they are basic features of the plug-in. Another key aspect of StoryBoard is that it seeks not to interfere with the user's current filing strategy. The features are thus accessible on a pane separate from the main views of Outlook (folders, inbox and reading pane).

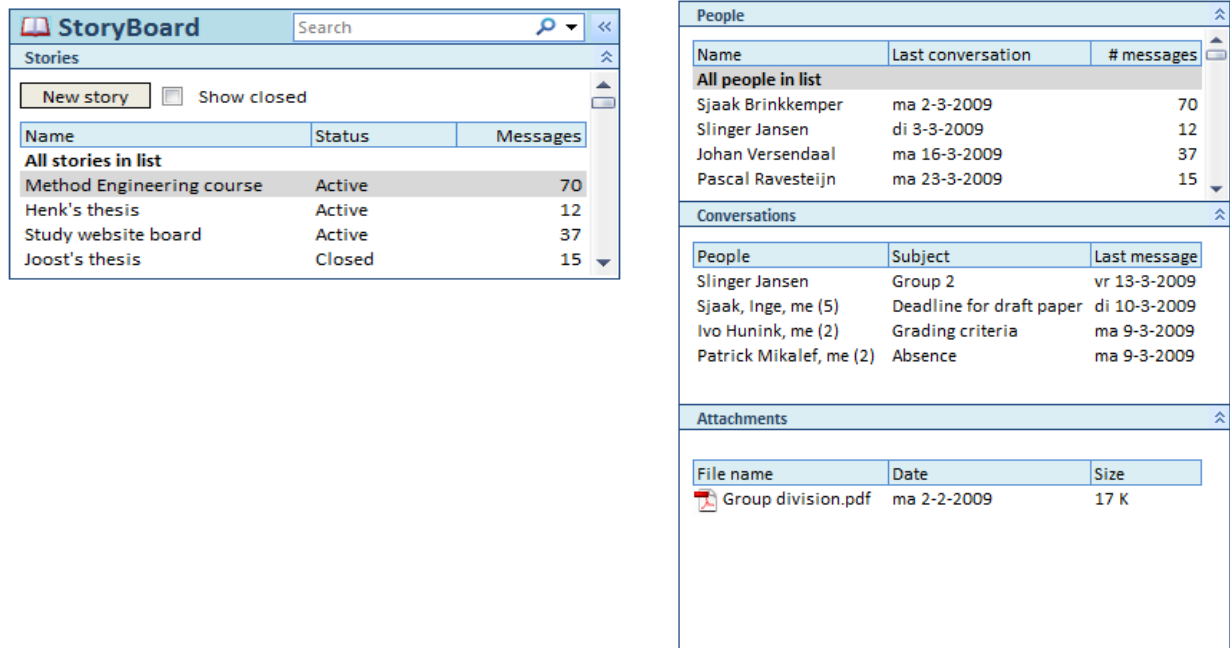
The pane has four views, each one representing a concept of the framework. The top two views, Stories and People (Users) act as general overviews but selecting an item from one of them also applies a filter to the other three views. The bottom two views, Conversations and Attachments, only serve as lists of items. An illustration of how StoryBoard fits into Microsoft Outlook 2007 can be seen in Figure 5.

Figure 5: StoryBoard in Outlook 2007.



The Story view, shown in Figure 6, represents the Story concept. The user can create new stories, modify existing ones or delete them in this view. Other than the name of the story and status (active or closed), the real data behind a story lies in its linked users, conversations and attachments. The user can choose whether the view shows all stories or only active ones. E-mail messages can be dropped on an item in the story view, thereby assigning them to that particular story. People (see below) can also be dropped on a story item, and then all received messages from this point onwards are assigned to that story. Selecting a story filters the people, conversation and attachment views so that only items belonging to the selected story are shown.

Administration of stories could be either personal or shared. For full flexibility, each user would administrate his or her set of stories. The alternative would be to have a shared repository of stories (and their participants) for a company or business unit. The administration of such a repository could be open and collaborative, or centralized and limited to those with access. A hybrid approach would be the personal version, with the possibility to invite other users to participate, and by accepting the invitation, the invited user automatically adds the story to his or her StoryBoard.

Figure 6: Story, People, Conversations, Attachments views.

The People view, shown in Figure 6, represents the User concept. By default, the view shows all users that are either senders or direct recipients of e-mail messages from the user. Selecting a user filters the story, conversation and attachment views so that only items belonging to the selected user are shown. Selecting both a user and a story narrows the display in the other views even further down.

The Conversations view, also shown in Figure 6, represents the Interaction concept. Here, all conversations are shown in a threaded view to reduce the number of lines. A conversation can be shown as such in a separate window.

The Attachments view, shown in Figure 6, represents the Deliverable concept. It shows all documents sent and received as part of correspondence related to a selected story. Finally, the full-text search feature (see Figures 5 and 6) is keystroke-sensitive and filters in real time all contents of the four views.

The model could possibly be utilized further by adding a collaborative web workspace to the set of features. Administration of stories would be web-based, open and collaborative, and for each “public” story, a workspace would automatically be set up, consisting of web access to conversations and deliverables, as well as an optional wiki. Document management would be more sophisticated, since both attachments and documents uploaded to the workspace would be accessible in the Outlook view and on the web.

We conclude that our conceptual model can easily be visualized and made more tangible. Moreover, the prototype helped us in identifying functions and features. These conclusions support the validity of the model.

CONCLUSIONS AND FURTHER RESEARCH

We have addressed the limitations of e-mail as a collaborative platform and proposed a model based on a fragment of Human Interaction Management to counter these limitations as well as a means to implement this part of HIM in an organization. We have presented a way to apply the model by means of a plug-in for a popular e-mail client, Microsoft Outlook.

Since the plug-in has only been conceptualized and presented as a mock-up, more work can be done to test the effectiveness of the plug-in and the validity of the model. A way to further test the model is by “fitting” the context (story) parameter and its related concepts to the integration of e-mail with existing collaborative workspace platforms, such as SharePoint or BaseCamp, with or without StoryBoard or a similar add-in.

The usage of the Story-concept from HIM to apply the context parameter to messages and attachments can be compared more extensively to case management, labels and archiving. The specific situations where each method or concept applies can be explored as well as the limitations of each.

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